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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/824,330	04/02/2001	James Michael Nelson	56081USA8A.002	9412

32692 7590 01/05/2007
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EXAMINER

HANDY, DWAYNE K

ART UNIT	PAPER NUMBER
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1743

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/05/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

09/824,330

Applicant(s)

NELSON ET AL.

Examiner

Dwayne K. Handy

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11/13/06.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,4-7,9-11,13 and 14 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-7,9-11,13 and 14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 11/13/06.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- ☐ Notice of Informal Patent Application
- ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Line 3 of claim 1 recites "providing at least one plug flow reactor". Line 4 then recites "the plug flow reactor". It is unclear which reactor this limitation refers to since there may be a plurality of reactors.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1, 2, 4, 6 and 9-12 are rejected under 35 U.S.C. 102(e) as being anticipated by Bergh et al. (6,749,814). The Examiner believes Applicant is familiar with

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the Bergh rejection. The rejection remains in effect. **Please see Response to Arguments below.**

Inventorship

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

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2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 5 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bergh et al. (6,749,814) in view of Priddy et al. (4,572,819). This rejection was made in the previous Office Action (mailed 6/30/2005). It remains in effect. **Please see**

Response to Arguments below.

8. Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bergh et al. (6,749,814) in view of Citron et al. (6,586,541). This rejection was made in the previous Office Action (mailed 6/30/2005). It remains in effect. **Please see**

Response to Arguments below.

Response to Arguments

9. Applicant's arguments filed 11/13/06 have been fully considered but they are not persuasive. Applicant has amended claim 1 to exclude temperature as one of the reaction variables. Applicant has then argued that Bergh does not teach any of the other variables listed in the claim and "does not describe varying the residence time, pressure, etc. at different points in time within a single plug flow reactor" (page 5, lines 14-16). The Examiner respectfully disagrees.

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10. The Examiner notes Applicant's own citation of column 45, lines 3-19, and directs Applicant to the first two cited lines: Residence times can be maintained substantially the same for each of the microreactors or **can be varied** for a group of microreactors or **for each of the microreactors**. The Examiner also directs Applicant to different portions of columns 43-45 highlighted in bold below:

(97) Alternatively, however, the reaction conditions can be controllably varied amongst the plurality of microreactors--either between one group of microreactors and another group of microreactors, or between each of the plurality of microreactors. Varied reaction conditions can be employed, for example, using an array of different candidate materials in repetitive experiments to determine whether certain reaction conditions favor certain of the candidate materials, or to determine a range of conditions for which certain candidate materials have the property of interest. As discussed below, varying of reaction conditions can also be employed using an array comprising a single material (e.g., catalyst) for process research and optimization. Exemplary reaction conditions that can be readily varied include temperature, pressure and residence times, among others.

(98) Several process conditions are typically of importance in connection with chemical processes, and particularly, in connection with chemical reactions. Such process conditions include primarily, without limitation, temperature, pressure and reactant residence time (e.g., reactant contact time with a catalyst). Selection of such parameters will vary with the particular reaction of interest, and/or for the particular research goals of interest. As such, a person of skill in the art can vary these parameters and others to suit their particular needs, and still be within the scope of the invention. Hence, the following exemplary design parameters are to be considered as non-limiting, except as specifically recited in the claims.

(99) Temperature in a reaction cavity and/or temperature of a candidate material of interest can be controlled by any suitable temperature-control device (e.g., heat transfer apparatus) known in the art for microfluidic applications. While such a device can be integrated into the chemical processing microsystem of the present invention in any suitable manner, the structural integrity of such device is preferably independent of the material-containing array. With reference to FIG. 2 and FIG. 8, for example, a temperature-control block 400 can operate as a heat sink (e.g., to maintain approximately constant temperature during an exothermic reaction), as a heat source (e.g., to maintain approximately constant temperature during an endothermic reaction), or as an insulator (e.g., to provide approximately adiabatic reaction conditions). The temperature-control block 400 can be, for example, a microfluidic heat exchanger (See, for example, U.S. Pat. No. 5,811,062 to Wegeng et al.), or a microscale resistive heating element. **The temperature can be maintained substantially the same in each of the microreactors, or can be varied between groups of microreactors or between each of the microreactors.** For example, a temperature gradient can be spatially applied across one or more directions of a material-containing array. As another example, spatially addressable independent heating elements can be used to individually control the temperature of each microreactor (or each candidate material). See, for example, U.S. Pat. No. 5,356,756 to Cavicchi et al. Appropriate microscale temperature-sensing devices, together with a suitable process control system, can also be employed. See, for example, S. M. Sze, Semiconductor Sensors, John Wiley & Sons, Inc. (1994).

(100) Pressure in a reaction cavity can be controlled on a microscopic scale by a number of different approaches. For example, the fluid pressure in the reaction cavity can be varied by actively controlling the flow resistance (e.g., with a microscale pressure-control valve) in the supply manifold or in the discharge manifold. In a passive microfluidic distribution system--lacking any active pressure-control components

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such as valves--pressure considerations are typically factored into the microreactor and distribution system design, by variation of flow conductance of either the supply or discharge manifold. For a system having an established microreactor design and an established passive distribution design, the pressure in the microreactor can be controlled by varying the supply pressure, varying the discharge backpressure and/or varying the reactant flow rates through the distribution system. **Pressures can be maintained substantially the same in each of the microreactors, or can be varied for a group of microreactors or for each individual microreactors** (for example, by varying the conductance of the distribution channel serving a group of microreactors or each microreactor. Appropriate microscale pressure-sensing devices, together with a suitable process control system, can also be employed. See Sze, Id. In general, for the preferred embodiments of the invention, higher pressures can be achieved by using microreactors formed in bonded, rather than releasably-sealed laminae--especially when the microsystem itself is under atmospheric conditions. Microreactors formed in releasably-sealed laminae can also be employed at higher pressures by placing the entire microsystem into a hyperbaric chamber such that the pressure difference between the reaction cavity and the atmosphere external to the microsystem is within the sealing capabilities of the releasable seal.

(101) Residence time in a reaction cavity can be designed based on microreactor volume and reactant flow rate through the microreactor. Flow rates are, in turn, dependent upon reactor inlet port and outlet port geometries, distribution system geometries and fluid pressures. **Residence times can be maintained substantially the same for each of the microreactors or can be varied for a group of microreactors or for each of the microreactors.** In one embodiment, a plurality of microreactors suitable for providing varying residence times for different microreactors is provided by fabricating the microreactors with varying volumes. With reference to FIG. 9, for example, the volume of each reactor well 235 could be varied between one group of microreactors and another group, or between each individual microreactor. In an alternative embodiment, a flow-distribution system suitable for providing varying residence times for different microreactors (now having substantially the same volume) is provided by fabricating flow distribution networks having varying flow restriction (and correspondingly varying conductance) between different flow channels such that the flowrates to different microreactors (or sets of microreactors) varies. With reference to FIG. 7B, for example, the total flow restriction of each flowpath could be varied between flowpaths to one group of microreactors and another group, or between flowpaths to each individual microreactor. In any case, appropriate microscale flow-sensing devices, together with a suitable process control system, can also be employed. See Sze, Id.

These passages, then, contain a recitation of varying reaction properties for each individual microreactor. The Examiner also directs Applicant to column 67, lines 30-38:

(171) According to one approach for optimizing a chemical process, the particular process of interest is effected in a multi-parallel fashion while varying only a limited number (e.g., one, two or three) of process conditions during each experiment. More specifically, one or more reactants are simultaneously supplied to each of four or more microreactors, a first set of reaction conditions is controlled to be substantially identical in each of the four or more microreactors, a second set of reaction conditions is controlled to be varied between two or more of the microreactors, the first and second set of reaction conditions are controlled, collectively, to effect the chemical reaction of interest, a reactor effluent is discharged from each of the four or more microreactors, and the effect of varying the second set of reaction conditions is evaluated. **To optimize a particular chemical reaction, for example, the same reaction can be effected simultaneously in two or more microreactors under reaction conditions that are substantially identical in each microreactor, except as to the controlled variation of, independently or collectively, temperature, pressure, residence time, relative amount of reactants, relative amounts of catalyst, etc.** Particular research strategies for a given process can be devised by persons of skill in the art.

11. In addition, the Examiner also notes that Applicant's current argument is beyond the scope of the claim as currently written. There is nothing in claim 1 that limits the method to introducing or changing over time at least one variable affecting the one or more components *in a single reactor* as being argued by Applicant. Claim 1 recites the steps of: providing at least one reactor, introducing one or more components into the reactor and *introducing or changing over time at least one variable affecting the components to produce a combinatorial library*. The portion of the claim italicized by the Examiner merely recites changing variables to affect the components and produce the library. It does not recite changing variables over time in a single reactor. Therefore, the Examiner submits that the limitations of claim 1 can be met by varying conditions in groups of reactors as also recited in Bergh. See, for example, claim 136 where Bergh recites a method that includes: providing an array of reactors, introducing one or more components, and controlling a first and second set of reaction conditions – the second set varied between two or more of the reactors - to affect the components and produce a combinatorial library.

Conclusion

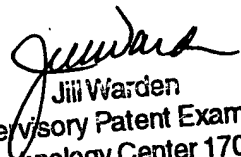
12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dwayne K. Handy whose telephone number is (571)-272-1259. The examiner can normally be reached on M-F 8:00-4:30.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill Warden can be reached on (571)-272-1267. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

DKH
December 31, 2006


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